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Nonlinear optical properties of implanted metal nanoparticles in various transparent matrixes: A review

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Abstract

Composite materials containing metal nanoparticles (MNPs) are now considered as a basis for designing new photonic media for optoelectronics and nonlinear optics. One of the promising methods for fabrication of MNPs is ion implantation. Review of recent results on nonlinear optical properties of cupper, silver and gold nanoparticles in various transparent dielectrics and semiconductors as glasses and crystals are presented. Composites prepared by the low energy ion implantation are characterized with the growth of MNPs in thin layer of irradiated substrate surface. Fabricated structures lead to specific optical nonlinear properties for femto-, pico-and nanosecond laser pulses in wide spectral area from UV to IR such as nonlinear refraction, saturable and two-photon absorption, optical limiting. Nonlinear properties of implanted composites in near IR are considered in details.